BEFORE THE STATE OF WASHINGTON

ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 2006-01: ENERGY NORTHWEST; PACIFIC MOUNTAIN ENERGY CENTER	**EXHIBIT __** (TWK-T)

APPLICANT'S PREFILED TESTIMONY

WITNESS: THOMAS W. KRUEGER

Introduction

Q: Please state your name and business address.

A: Thomas W. Krueger, Energy Northwest, P.O. Box 968, Richland, WA 99352-0968.

Q: What is your position at Energy Northwest?

A: Manager of Generation Resource Development.

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Q: What does your role at Energy Northwest entail?

A: My role at Energy Northwest is to direct and manage the development of renewable and thermal power generation resources.

Q: What is your role with respect to the Pacific Mountain Energy Center ("PMEC")?

A: I have a project development role for PMEC. Accordingly, I am responsible for PMEC's business concept, feasibility study, and development plan. I was the PMEC Project Manager in 2005-2006. In my new role, I oversee the Project Manger, who is Ted Beatty, and directly assist with various aspects of project development and finance.

Q: Please describe your background.

A: I have over twenty-five years experience in utility operations, power & natural gas marketing, and power plant & biofuel project development. I have successfully led the development of high tech electrical systems & infrastructure, ethanol production, as well as several thermal and renewable power generation facilities.

I received a Bachelor of Science in Mechanical Engineering from Montana State University. I have had advanced coursework in electrical engineering, management, and project finance from the University of Portland and University of Texas. My resume is attached as Exhibit __ (TWK-1) to this testimony.

Q: What will you address in your testimony?

A: My testimony will describe PMEC and its associated infrastructure, explain the proposed ownership and operational responsibilities for PMEC, describe the role of PMEC in the

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regional resource portfolio and describe the role of PMEC in the Energy Northwest resource profile.

Pacific Mountain Energy Center

Q: Would you briefly describe PMEC?

A: PMEC will be an approximately 793 MW Integrated Gasification Combined Cycle ("IGCC") facility located on approximately 95 acres in the Port of Kalama's north industrial area. The facility will include an enclosed fuel handling and storage area with access to a deep water port and multiple rail systems, as well as a natural gas pipeline and high voltage transmission system. The facility includes access roads, a rail spur and loop track. Utilities and specialty gases that are not created on site will be supplied through local supply companies. PMEC's generation capability includes 80 MW with gas-fired duct combustors which can firm and shape intermittent wind generation or provide a regional power reliability reserve.

Q. Has the size of the project changed since the application was filed?

A. Yes, the project is now estimated at 793 MW. At the time the application was prepared in the summer of 2006, the project size was estimated at 600 MW. Earlier this year, Energy Northwest notified EFSEC in a letter dated February 6, 2007, that we planned to include duct firing. The addition of duct firing increased the project output by 80 MW to 680 MW. The additional emissions were included in the revised Prevention of Significant Deterioration ("PSD") permit application filed March 30, 2007. Since that time, our Engineering, Procurement and Construction ("EPC") contractor has identified up to 30 MW that can be achieved through improving the efficiency of the plant operation, bring the capacity up to 710 MW. We have also identified an external source for the air separation unit ("ASU"). The ASU provides oxygen for the gasification process and nitrogen for NOx control. The

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ASU has been considered a parasitic load on the project in that it requires approximately 83 MW of power for its operation and when it was located on PMEC's site, it reduced capacity by that amount. There is an existing industrial air company adjacent to the facility site that could supply the oxygen and nitrogen. Under the current demanding market conditions for contractors, it is necessary to separate large process islands in order to cover both construction and long term operational risks. Total turn key lump sum projects are not being offered as they were just a couple of years ago. By contracting with an external company, the PMEC's output would be increased by 83 MW to 793 MW.

Q. Does the change in project size increase air emissions over what has been previously filed with EFSEC?

A. No, the addition of duct burners was considered in the revised air permit application filed on March 30, 2007. The increase in efficiency of 30 MW does not change the air emissions, other than somewhat reducing emissions on a per-KWh basis. The ASU does not have air emissions so its removal does not change the air emission calculations.

<u>PMEC and Integrated Gasification Combined Cycle Technology</u>

Q: Please describe how the Integrated Gasification Combined Cycle technology works.

A: Briefly, the IGCC technology includes two major integrated processes: the gasification process and the combined cycle power generation process.

In the gasification process, feed stocks such as petroleum coke and coal are pulverized, blended, and transported into a pressurized vessel (called the gasifier) along with purified oxygen. In the gasifier, controlled reactions take place, thermally converting feed stock materials into a low British Thermal Unit ("BTU") gaseous fuel known as synthesis gas or

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syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a gas turbine, which is directly connected to an electric generator.

The electric power generating units would have three sources of power generation – two combustion turbine-generators ("CTGs") and one steam turbine generator ("STG"). The expansion of hot combustion gases inside the combustion turbines creates rotational energy that spins the generators to produce electricity. The hot exhaust gases exiting the CTGs pass through heat recovery steam generators ("HRSGs"), a type of boiler where steam is produced. The resulting steam is piped to the steam turbine, which is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity.

Thomas A. Lynch, a Principal Project Director for ConocoPhillips Company, who has been working with Energy Northwest and Fluor Corporation over the past 24 months in connection with preliminary engineering and design work for PMEC, is also providing prefiled testimony in support of PMEC and can answer questions related to the gasification technology that will be used at PMEC.

Q: What is PMEC doing to reduce its greenhouse gas ("GHG") emissions?

A: Energy Northwest is committed to reducing PMEC's GHG emissions, including the primary GHG that will be emitted from PMEC, carbon dioxide ("CO_2"). The goal is to be a leader in the industry and to set an example that will facilitate IGCC plant construction with a significant CO_2 capture and sequestration component in places where power needs would otherwise be met by direct-fired coal plants, such as China. In addition, Energy Northwest will optimize the design and fuel blending to minimize the GHG/MWh. Ted Beatty of

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Energy Northwest will detail Energy Northwest's plans to reduce GHG emissions from PMEC in his testimony.

PMEC's IGCC design represents the integration of advanced technologies to produce a clean burning synthesis gas from solid or liquid feed stocks such as petroleum coke (a refinery waste), coal, or even biomass. Heat and water are shared between the gasification and power complexes. This design results in significantly improved efficiency and performance of the overall energy complex. Consequently, all emissions, including CO_2, are significantly reduced when compared to a conventional solid fuel plant. During certain times of the day and year, it should be economical to increase the efficiency through natural gas blending to reduce GHG/MWh for operational compliance.

By utilizing petroleum coke ("petcoke") as the primary feedstock (over 90%), PMEC will be processing a waste product from the refining of petroleum products that would otherwise be burned in a furnace or boiler. Refineries will create petcoke as long as gasoline is used as a fuel in the United States. Most western petcoke is sent to Asia to be burned. As a result, GHG emissions from petcoke will be produced whether or not PMEC is permitted and operating. PMEC, however, results in a better GHG profile for the petcoke because its emissions are substantially lower on a per-BTU basis than the other facilities that use petcoke as a fuel. PMEC is currently in the final stages of completing a long term petcoke supply contract for almost all of its feedstock requirements.

The syngas manufacturing portion of the PMEC complex is designed to effectively separate CO_2 from the synthesis gas prior to delivering it to the power generation facilities. Energy Northwest will spend over $50 million to install this capability and another $10 million to

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characterize nearby geological storage formations such as deep saline aquifers, basalts, and unmineable coal beds. As sequestration science, policy, and technology advance, PMEC is one of few plants in the United States that will be capable of capturing CO_2 for potential permanent storage in geological formations. Until such storage is feasible, PMEC will reduce emissions to the statutory standard through a combination of operational efficiencies on site, at other power generation plants in the western interconnection, or other acceptable methods as approved by EFSEC.

PMEC will be the most advanced power generation facility in the region. Energy Northwest plans to expand our work with DOE and with an approved site certification team with federal agencies, regional universities, and local community colleges to expand technical expertise, research, and job training in GHG reduction technologies and applications. Energy Northwest expects that PMEC will attract existing industry experts to the area and position the State of Washington as a recognized world leader in proving climate change solutions and education.

Q: Why is the IGCC technology important?

A: The deployment of IGCC is a major technological component of a GHG management solution. Mastering this technology in the United States sets a standard that can be exported to emerging economies around the world. While the estimates vary, it is clear that countries like China and India will be building coal plants at a rapid pace for the foreseeable future. IGCC is considered the most advanced coal technology for GHG capture and storage. And, even without the sequestration component, an IGCC facility will have significantly less CO_2 emissions than a conventional coal plant. We have the opportunity to pioneer this

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technology for the world, create a new industry standard, and further reduce production of CO_2 on a global scale.

CO_2 emissions are very different from SO_2 and NOx emissions. They do not impact local visibility or create acid rain. The climate change associated with GHG emissions is a global issue and the solutions need to be global in order to be effective.

PMEC's Ownership and Operational Structure

Q: Will Energy Northwest own and operate PMEC?

A: Energy Northwest, a municipal corporation and joint operating agency operating in the State of Washington, is developing PMEC. Energy Northwest, perhaps together with its participating public power members, will own a portion of the gasification complex, a generating unit of less than 350 MW and an interest in the other equipment at the site. Pacific Mountain Energy Group, LLC (PMEG, LLC), a Washington State limited liability corporation, or other private entities such as investor-owned utilities, will own the remainder of the gasification complex, the other two generating units, and the balance of the interests in the other equipment at the site.

Energy Northwest or a qualified contract operator under Energy Northwest's supervision will operate all elements of PMEC. As discussed above, the ASU is expected to be owned and operated by an independent specialty air products company with a defined supply agreement.[1] Water supply and the shipping dock will owned by the Port of Kalama. A sixty year industrial property lease with the Port has been completed.

[1] Energy Northwest will finalize its ownership and operation plans for the ASU as it proceeds with the design and construction plans for PMEC. If necessary, Energy Northwest will amend its site certification application to reflect any revised plans for the ASU.

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PMEC and the Region's Energy Needs

Q: Why does the region need PMEC?

A: The Northwest region is experiencing above-average load growth, increasing wholesale power price volatility and a lack of base load generation. It is important to build new and diverse sources of generation in order to meet our growing power supply demands. Pacific Northwest publicly and privately owned utilities need reliable resources to meet their retail electric loads and have expressed strong interest in PMEC to meet those needs.

Energy Northwest is proposing to provide affordable and reliable base load electrical power for the Pacific Northwest. The Fifth Northwest Electric Power and Conservation Plan ("Fifth Power Plan") issued in May 2005 by the Northwest Power and Conservation Council states that "the region's individual utilities are currently in deficit … [and] the role of the [Independent Power Producers] in the region's electricity future is unclear." In the Fifth Power Plan,[2] electricity demand in the Northwest was projected to grow at an average annual rate of nearly 1 percent per year, resulting in an over 5,000 megawatt deficit by 2025 using the medium load growth forecast. By the time the Northwest Power and Conservation Council issued the Fifth Power Plan, it was clear that the demand for new power resources exists in the Pacific Northwest. The Northwest Power and Conservation Council chose IGCC as a viable resource technology in the Fifth Power Plan, which concluded that "the region should secure sites and permits to be prepared to begin construction of new coal generating resources as early as 2010."

[2] Available at http://www.nwcouncil.org/energy/powerplan/plan/Default.htm .

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According to the April 2007 PNUCC Northwest Regional Power Forecast report (Exhibit __ (TWK-2), regional loads continue to grow and the region could need around 1000 MW in new capacity in 2008 with an anticipated additional need of 5000 MW over the next ten years. The data indicates that the region has set new records and that load growth has more than completely offset the load loss from the 2000-2001 energy crisis.

In the BPA July 2006 regional dialogue proposal, BPA estimated that in 2012 it may have a deficit of up to 800 MW under a high load growth (2.5%) scenario for their preference customers alone. BPA recently issued the 2006 Pacific Northwest Loads and Resources Study (2006 White Book), which expresses a strong sense of urgency to create new energy sources (http://www.bpa.gov/power/pgp/whitebook/2006).

Common estimates for the annual load growth in the coming decade range from 1 to 2%. Energy Northwest anticipates load growth that mirrors economic development, likely in the 1.5% per year range. Over six years that equates to more than 9% or 1800 MW growth over present load base. Regional load growth in the Northwest power system over the last few years has well exceeded the 1.5% rate.

In addition, the region continues to experience high voltage transmission constraints. The majority of power generation including hydroelectric, nuclear, coal, and natural gas resources are located on the eastern side of the BPA system, while the large growing load centers are on the western portion of the system.

Meeting future electricity demand requires planning carefully today. The last of the federal hydroelectric system's capacity will be fully allocated in 2008 through the BPA contracts

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that become effective in 2011. Increased regional wind development requires additional base load and peaking resources to manage that intermittent supply. This power management will not be provided by hydroelectric resources as it has in the past after the system is fully allocated. In addition, it is important to start to develop new generation sources now because of the very long lead times for equipment and construction schedules associated with the development of large energy facilities. Waiting for regional demand to increase even more before beginning work on new base load resources would eventually leave the region and state short of reliable, affordable power and leave utilities and consumers at the economic mercy of the volatile open power market. This could lead to a set of conditions similar to those that prompted the Western energy crisis of 2000-2001.

Q: What other technologies did Energy Northwest consider?

A: To meet Washington's current and future energy needs, both base load and intermittent resources are required. Diversification of regional resources is important to keeping a balance between cost, environmental impacts and system reliability. Energy Northwest believes utilities must continue to provide balance and stability to the electric grid with responsible base load generation. In evaluating alternative technologies, Energy Northwest pursued a balanced approach, considering future needs along with the near-term needs of providing new energy sources by the year 2012.

Prior to selecting IGCC technology, Energy Northwest considered conservation, renewable energy (wind, solar and hydroelectric), nuclear power, conventional coal plants, natural gas and IGCC.

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Conservation: Energy Northwest is a strong advocate of conservation as a first choice for Washington's energy future. However, there are physical, economic and social realities that result in limits to the rate and extent to which conservation resources can be deployed. Energy Northwest believes that conservation will reduce but not keep up with Northwest load growth.

Renewable Energy: Energy Northwest is developing and operating renewable energy projects, primarily wind turbines, to add to our existing renewable base of wind, solar and hydroelectric generators. Energy Northwest is also engaged in evaluating and promoting advanced and emerging renewable resources such as solar, biomass, waste to resources, and wave and tidal energy technologies. Wind, solar and many other renewables will provide a significant contribution to Energy Northwest's energy portfolio in the future, and we have a strong commitment to continue our leadership in that arena. There are, however, limitations on our ability to rely exclusively on renewables to meet growth. For wind, there are a declining number of wind sites, increasing costs, difficulty of obtaining equipment, and the unavailability of transmission from wind sites in eastern Washington and Oregon. Many renewables have issues of commercial availability and scale. We determined that a large base load energy source was needed to meet the supply requirements of our utility participants and this base need could not be met with intermittent energy sources such as wind or solar.

Hydroelectric generators use a renewable resource and do not emit air emissions. But viable sites for new large hydroelectric dams are limited, and the environmental impacts of building and operating a new dam are large. We determined that it was not feasible to consider siting and constructing a dam of sufficient size to produce 680 MW or more of new energy by the

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year 2012. We are, however, investing substantial resources in the relicensing of our Packwood hydroelectric project so that we can continue to meet a portion of regional needs with this clean resource. Ocean, tidal and kinetic hydropower technologies are interesting, but are small-scale and often raise concerns about impacts on aquatic environments.

Nuclear Power: Nuclear power is enjoying renewed interest. Evaluation and any deployment of new nuclear base load will take substantial time, and is not expected to be available soon enough to meet the shortfalls described above.

Conventional Coal: Conventional coal combustion provides over 50% of the electricity in the United States, and is increasingly being used in developing countries such as China. New coal plants continue to be proposed, partly because it is a relatively cheap process to burn coal and make electricity, and partly because of large domestic coal reserves. The environmental impacts to air quality are significant, even with advanced "emission controls". For us, the environmental footprint of coal combustion pushed the technology out of consideration.

Natural Gas: Natural gas combustion turbines, the technology of choice for new base load generation for the past several decades, are declining in favor. Natural gas is becoming scarce and expensive, and many planned combustion turbines have been cancelled. Due to volatile natural gas prices, many operating natural gas plants are sitting idle much of the time. The future of natural gas supplies is uncertain as it becomes more difficult to obtain new supplies. Energy Northwest determined that it does not seem prudent to rely on natural gas for all or even most of our future base load generation.

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IGCC: Gasification offers the cleanest, most efficient method available to produce synthesis gas from low or negative-value carbon-based feed stocks such as coal, petroleum coke, high sulfur fuel oil or materials that would otherwise be disposed as waste. The syngas can be used in place of natural gas to generate electricity, or as a basic raw material to produce chemicals and liquid fuels.

The combined cycle system has two basic components. A high efficiency gas turbine, widely used in power generation today, burns the clean syngas to produce electricity. Exhaust heat from the gas turbine is recovered to produce steam to power a traditional high efficiency steam turbine. By integrating the coal gasification process with combined cycle power generation, coal can be converted to a clean-burning syngas and used as fuel instead of natural gas.

Q: Why did Energy Northwest choose the IGCC technology?

A: Energy Northwest found the following advantages of IGCC:

- The process can use a wide range of feed stocks and can take advantage of low-cost petcoke or coal. PMEC has a goal and is currently negotiating an supply agreement to use petcoke (90-100% depending on actual characteristics) for a strong waste to resource power generation project.
- With the ability to use petcoke or coal, the pressure on natural gas supplies is reduced, preserving those supplies for residential heating and other uses that don't have the option of other feed stocks.
- IGCC takes advantage of high efficiency combined cycle power generation technology.
- IGCC has air emissions similar to natural gas and can effectively remove and dispose of mercury (at least 90%) in syngas.

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- IGCC has the potential to support production of hydrogen, substitute natural gas, and clean diesel as well as the creation of other high value byproducts.
- IGCC technology provides an opportunity for reduced GHG emissions and CO_2 capture. Gasification-based power generation plants facilitate carbon sequestration. This technology can effectively capture carbon with lower operational and capital costs than other coal or petcoke fueled power plants.
- IGCC deployment will expand Washington's technical work force in advanced technologies and applications.

Energy Northwest has determined that IGCC technology is the top base load resource choice for the region and for Energy Northwest due to its environmental performance, abundant and diverse feed stocks, and cost competitiveness. The ability to blend fuels, capture carbon, and co-produce clean alternative energy products allows IGCC to be a low cost competitive power generation resource now and into the future.

Q. Does this complete your testimony?

A. Yes it does.

EXHIBIT LIST

Ex. No.	Prefiled No.	Description
	TWK-1	Thomas Krueger's resume
	TWK-2	Northwest Regional Forecast of Power Loads and Resources – PNUCC April 2007
	TWK-3	PNUCC - Principles of Global Climate Change Legislation – April 06, 2007

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